

Application No. 10/573,301
After Final Office Action of May 17, 2010

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REMARKS

In the Office Action dated May 17, 2010, claims 1-14 are pending, claims 6-13 are withdrawn from consideration and claims 1-5 and 14 are rejected. The rejection is made final. Reconsideration is requested for at least the reasons discussed hereinbelow.

The present invention, as set forth in claim 1, is directed to a manufacturing method of a liquid crystal display panel, comprising:

a sealant arranging step of arranging a sealant on a main surface of one of or each of two substrates to be bonded to each other;

a liquid crystal dropping step of dropping liquid crystal on one of said two substrates; and

a bonding step of bonding said two substrates to each other, wherein said method further includes:

to be performed prior to said sealant arranging step, a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates; and

to be performed prior to said bonding step, a releasing step of releasing said pressure-reduced atmosphere by an inert gas.

Claims 1-5 and 14 are rejected under 35 U.S.C. §103(a) over Horiuchi et al. (US 2005/0024580; "Horiuchi") in view of Uh et al. (US 6,892,437; "Uh") and Oshima et al. (US 5,725,032; "Oshima"). The Examiner admits at least that Horiuchi *fails* to disclose "a liquid dropping step of dropping liquid crystal on one of two substrates" and that "a releasing step is performed by an inert gas." Uh is cited to make up for the lack of disclosure of the liquid dropping step and Oshima is cited to make up for the lack of disclosure of the releasing step. The Examiner concludes that it would have been obvious to one having ordinary skill in the art to employ a method of dropping liquid crystal on one of two substances to minimize liquid crystal consumption, cost and waste, and to employ a releasing step using an inert gas.

Applicant strongly disagrees that the presently claimed invention would have been obvious to

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one of ordinary skill in the art in view of any combination of Horiuchi, Uh and Oshima.

Horiuchi discloses a process for attaching a plastic substrate to an opposing TFT substrate when making a LCD device. After the two substrates are attached, the liquid crystal material is inserted between the attached substrates through an injection port under vacuum. Thus, Horiuchi fails to teach or suggest, at least, as claimed herein: (1) prior to said sealant arranging step, a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates, (2) a sealant arranging step of arranging a sealant on a main surface of one of or each of two substrates to be bonded to each other, (3) a liquid crystal dropping step of dropping liquid crystal on one of said two substrates, and (4) prior to said bonding step, a releasing step of releasing said pressure-reduced atmosphere by an inert gas. The bonding step necessarily comes after the liquid crystal dropping step.

The Examiner alleges that "Horiuchi discloses that prior to the sealant arranging step, a deaerating step of arranging in a pressure reduced atmosphere at least a substrate on which the sealant is to be arranged out of the two substrate (paragraphs 31 and 35)." Applicant strongly disagrees.

Horiuchi paragraph [0031] discloses, with respect to FIG. 3A, that a plastic substrate 1 is transferred into a vacuum chamber 100 and placed on lower plate 101. Then, upper plate 103 is disposed to face the lower plate 101 and a glass substrate 3 is provided as a support for the plastic substrate 1. "Thereafter, the vacuum chamber is evacuated." Clearly, there is no teaching or suggestion in Horiuchi to perform "a deaerating step of a of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates" prior to said sealant arranging step, as recited in the present claims. Indeed, the pressure-reduced atmosphere (evacuating the vacuum chamber) is not performed until after the substrates are arranged in the vacuum chamber. There is no suggestion in Horiuchi to evacuate the vacuum chamber prior to the sealant arranging step.

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Horiuchi paragraph [0035] relates to FIG. 5A, a different embodiment from FIG. 3A. Nothing in paragraph [0035] suggests evacuating the vacuum chamber prior to the sealant arranging step. Indeed, in paragraph [0036] Horiuchi first mentions a vacuum for this embodiment. There, it is stated that the liquid crystal material that “a liquid crystal material is injected into a space between the plastic substrate 1 and the TFT substrate 51 via a liquid crystal injection port (not shown) under vacuum conditions.” Clearly, the vacuum condition is applied after sealing of the substrates into a configuration wherein the liquid crystal material is injected through a port.

The Examiner further submits that “Horiuchi discloses a sealant arranging step of arranging a sealant on a main surface of one or each of two substrate to be bonded to each other (paragraph 35).” Applicant agrees that Horiuchi discloses arranging a sealant on a main surface of one or each of two substrate to be bonded to each other. However, as discussed above, Horiuchi fails to teach or suggest evacuating the vacuum chamber prior to the sealant arranging step.

Next, the Examiner submits that “Horiuchi discloses prior to the bonding step, a releasing step of releasing said pressure-reduced atmosphere (paragraph 33).” Applicants strongly disagree.

Horiuchi paragraph [0032] states that the upper plate is brought down on the lower plate to press the plastic substrate 1 on the lower plate under the evacuated condition described in paragraph [0031]. Thereafter, the vacuum condition is broken [0033]. Thus, nothing in Horiuchi teaches or suggests that prior to the bonding step, a releasing step of releasing said pressure-reduced atmosphere is performed.

Uh describes a liquid crystal dropping step in the Background of the Invention. There, Uh states that “the liquid crystal dropping method has problems” [col. 3, lines 62-63]. Uh discloses a method of fabricating LCDs that avoids unnecessary processing of NG (“no good”) individual liquid crystal panels by using stored information about NG substrate panel areas and grinding cutting faces of only good individual liquid crystal panels in a continuous fabrication line. However, nevertheless, Uh discloses that the liquid crystal dispensing process, wherein liquid

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crystal is dropped onto each substrate panel area of the TFT substrate, is carried out as follows [col. 6, line 62 - col. 7, line 14]:

- i. removing dissolved air in the liquid crystal in the liquid crystal container by a vacuum;
- ii. assembling the liquid crystal container into a syringe on a head of a dispensing apparatus;
- iii. dropping liquid crystal dots having a uniform pitch on each unit TFT substrate area;
- iv. loading the CF substrate and the TFT substrate into a vacuum chamber and assembling into a composite liquid crystal panel, thereby spreading the liquid crystal over the panel substrate areas to form unit liquid crystal panel areas; and
- v. curing the seal material to form a liquid crystal panel having a plurality of unit liquid crystal panel areas.

Thus, Uh fails to teach or suggest at least the following steps:

to be performed prior to said sealant arranging step, a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates; and

to be performed prior to said bonding step, a releasing step of releasing said pressure-reduced atmosphere by an inert gas,

as set forth in present claim 1.

It is not seen how one of ordinary skill in the art combines the process of Horiuchi, which involves injecting liquid crystal between two bonded substrates, and the process of Uh, which drops liquid crystal dots on one substrate before the two substrates are bonded together.

In reply, the Examiner submits that Uh "discloses that the liquid crystal dropping step is performed before the bonding step. Therefore, one of ordinary skill in the art would have known to modify the teachings of Horiuchi so that the liquid dropping step would be performed prior to the bonding step." Applicant respectfully submits that the Examiner fails to show how a combination of Horiuchi and Uh would teach or suggest to one of ordinary skill in the art that "a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates" is performed "prior to said sealant arranging step" and "a

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releasing step of releasing said pressure-reduced atmosphere by an inert gas" is performed "prior to said bonding step."

Both Horiuchi and Uh fail to teach or suggest that "a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates" is performed "prior to said sealant arranging step." Thus, it is not seen how the combination would teach or suggest that "a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates" is performed "prior to said sealant arranging step."

Because neither Horiuchi nor Uh, nor their combination teach or suggest that "a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates" is performed "prior to said sealant arranging step," it is not seen how the combination can teach or suggest "a releasing step of releasing said pressure-reduced atmosphere by an inert gas" is performed "prior to said bonding step." Clearly, the bonding step must be performed after the sealant arranging step.

Thus, neither Horiuchi nor Uh, nor their combination teach or suggest releasing the pressure-reduced atmosphere after placing liquid crystal on the substrate but prior to bonding the two substrates together to form the LCD cell.

Oshima *fails* to make up for the deficiencies of Horiuchi and Uh. Although Oshima discloses releasing a pressure-reduced atmosphere with an inert gas, Oshima *fails* to teach or suggest releasing the pressure-reduced atmosphere after placing liquid crystal on the substrate but prior to bonding the two substrates together to form the LCD cell. Indeed, Oshima also teaches filling the bonded substrates with liquid crystal under vacuum by releasing the pressure-reduced atmosphere.

Thus, none of the cited references, taken alone or all in combination, teach or suggest (1)

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prior to said sealant arranging step, a deaerating step of arranging in a pressure-reduced atmosphere at least a substrate on which said sealant is to be arranged out of said two substrates, (2) a sealant arranging step of arranging a sealant on a main surface of one of or each of two substrates to be bonded to each other, (3) a liquid crystal dropping step of dropping liquid crystal on one of said two substrates, and (4) prior to said bonding step, a releasing step of releasing said pressure-reduced atmosphere by an inert gas, as set forth in claim 1.

Claim 14 and the dependent claims are patentable for at least the reasons discussed above.

Thus, it is not seen how the presently claimed invention would have been obvious to one of ordinary skill in the art in view of any combination of Horiuchi, Uh and Oshima.

If for any reason a fee is required, a fee paid is inadequate or credit is owed for any excess fee paid, the Commissioner is hereby authorized and requested to charge Deposit Account No. 04-1105.

In view of the discussion above, Applicant respectfully submits that the pending application is in condition for allowance. An early reconsideration and notice of allowance are earnestly solicited.

Dated:

10 Aug. 10

Respectfully submitted

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